REMARKS

This amendment under 37 C.F.R. § 1.111 responds to the Official Action of June 6, 2001.

Claims 1 through 29 are pending. Claims 1 through 14 and 20 through 25 are amended. Claims 15 through 19 and 26 through 29 are deleted.

1. Restriction Requirement

The Examiner withdrew claims 15 through 19 as being drawn to a nonelected invention. The applicants delete these claims by this amendment.

2. Rejection Under 35 U.S.C. § 112, First Paragraph

The Examiner rejects claims 1 through 14 and 20 through 29 under 35 U.S.C. § 112, first paragraph, for lack of enablement. The applicants traverse this rejection and request reconsideration.

The Examiner's rejection for lack of enablement acknowledges that the claims "are all drawn to a device that is to be used in the performance of any of a variety of polynucleotide assay protocols." The Examiner states that "[s]uch intended usage is clearly directed to areas of chemistry, which have been recognized by the Court as being unpredictable and deserving of greater enabling disclosure." The Examiner does not make any objection to the claimed assay apparatus as lacking enablement. The Examiner relies on the text of U.S. Patent Number 5,200,313 to Carrico and quotations from Genentech v. Novo Nordisk A/S, 42 U.S.P.Q.2d 1001 (1997).

The applicants maintain that the Examiner's rejection is improper in that the patent statutes and case law only require the applicants to provide an enabling disclosure for their

claimed invention. The applicants are not required to provide an enabling disclosure in another art such as hybridization processes. Hybridization processes are known in the prior art as explained by the applicants from page 1 at line 9 through page 2 at line 11 of their application.

The applicants design and build equipment. The claims of their application are directed to a type of equipment known as a "polynucleotide assay apparatus." The applicants' disclosure, which includes 26 drawings, enables "any person skilled in the art" of building polynucleotide assay equipment to make and use the applicants' claimed equipment.

The applicants, as equipment manufacturers, desire to build and sell their assay equipment to scientists that conduct hybridization assay processes whether their hybridization process is known or yet to be discovered. Notwithstanding the applicants' objection to the Examiner's rejection, the applicants note that their application does disclose hybridization processes as follows.

The applicants describe the preparation of a DNA fragment as an example of target polynucleotides on page 15 at lines 6 through 8, and provide an example of the DNA probes from page 15 at line 9 through page 16 at line 3.

The applicants describe the "procedure of assaying" with the assaying apparatus in Figure 24 and on page 50 at line 12 through page 51 at line 15. The temperature at hybridization is set between 55°C and 65°C as shown on page 50 at lines 20 through 27. The complementary strand extension reaction is performed under the condition described on page 18 at lines 11 through 17. After the removal of unreacted substrate mixture under the condition described on page 50 at line 27 through page 51 at line 4, the measurement of the

electrochemiluminescence is performed under the condition described on page 20 at line 18 through page 21 at line 20.

The specification provides an example of the starting material and the reaction conditions identified above. Therefore, the enablement for any person skilled in the art of polynucleotide assay apparatuses is achieved.

The hybridization reaction condition and washing conditions are described in column 6 at lines 13 through 30 of the enclosed copy of U.S. Patent Number 5,434,049. The enclosed reference of Proc. Natl. Acad. Sci. USA Vol. 93, 10614-19 (1996) also shows the condition of hybridization reaction at lines 34 through 43 on the right column of page 10614. Therefore, enablement is also achieved by the attached articles.

The Examiner's citations of the Carrico '313 patent and the Genentech v. Novo Nordisk A/S case appear to be inappropriate. The Carrico '313 patent contains nine claims directed to a "nucleic acid hybridization method." The patent at issue in the Genentech case recited "a single claim directed to: [a] method of producing a protein . . . ." The claims of the cited patent and case are not directed to an apparatus. This fact explains the requirements for the claims of these two patents to be enabled by disclosures of chemical methods.

Neither of these citations stands for the proposition that a claimed assay apparatus requires enablement of a hybridization process when, as acknowledged by the Examiner, the apparatus or device is to be used in the performance of any of a variety of polynucleotide assay protocols. This rejection should be withdrawn.

The applicants delete claims 26 through 29 by this amendment in order to simplify prosecution of the elected claims. The amendments to claims 1 through 14 and 20 through 25 redefine limitations without narrowing the claims.

CONCLUSION

The applicants' claims recite an apparatus that is not disclosed or made obvious by the prior art. Favorable consideration of the application is requested.

The Commissioner is authorized to charge any fees due with this response to Deposit Account No. 50-1417.

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on September 6 2001 by

MARKED-UP VERSION OF REWRITTEN SPECIFICATION

Please delete the paragraph on page 18 at lines 11 through 17 and replace it with the following paragraph.

In the first embodiment, wherein (4) of the above-listed compositions [is] are used, 2 μL (microliters) of substrate mixture containing 2.5 mM each of dATP, dCTP, [dGTPk] dGTP and Ru:dTTP is added to the DNA detecting cell and, after denaturing reaction (for 10 sec) at 94°C once to a few times in repetition, an extending reaction is carried out at 72°C.

Please delete the paragraph on page 43 at lines 7 through 18 and replace it with the following paragraph.

In the first through sixth embodiments, the DNA probes 13, 14, 15 and 16 fixed to the DNA detecting cell are oligonucleotides each having a phosphoric acid diester bond between 2'-deoxyoligonucleosides. In the [ninth] seventh embodiment of the invention, as shown in Figure 18, oligonucleotides each having a phosphorothioate bond (reference numeral 231) between 2'-deoxyoligonucleosides are used as the DNA probes 13, 14, 15 and 16 and fixed to the DNA detecting cell in the first through sixth embodiments. B shown in Figure 18 denotes a nucleic acid base (any of A, T, G and C). DNA probes having a phosphorothioate bond [is] are not decomposed by S1 nuclease.

Please delete the paragraph on page 49 at lines 16 through 21 and replace it with the following paragraph.

While Ru:dNTP or Ru:ddNTP is used to carry out the extending reaction of DNA probes hybridized with target DNA fragments in the first embodiment, the [seventh] ninth

embodiment uses a method involving no execution of the extending reaction. ECL-labeled oligonucleotide 28 is coupled to the target polynucleotide (target DNA fragments) 21 in advance.

MARKED-UP VERSION OF REWRITTEN CLAIMS

Please delete claims 15 through 19 and 26 through 29 without prejudice.

Please amend claims 1 through 14 and 20 through 25 as follows.

1. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111, 52, 60)] to which different DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(3, 4, 5, 6, 61-1 through 61-6, 82-1 through 82-4)] differing with [the] a type of DNA probe and a second electrode(s) [(113-1, 113-2, 53, 62-1 through 62-3, 83-1 through 83-4)] opposite to said first electrode;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said second electrode; and

an optical detector [(33, 34, 35, 36, 43, 72-1, 72-2, 246)] for [trapping said] detecting target polynucleotides which are trapped by [through] hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides [(21)],

wherein [carrying out] an extending reaction using a base [(24)] labeled with an electrochemiluminescence (ECL) label to extend said hybridized DNA probes is performed, [and thereby detecting] ECL resulting from the application of said voltage is detected, [;] and the presence or absence of any extended chain [(26)] generated by said extending reaction is detected.

2. (Amended) A polynucleotide assay apparatus[, as stated in Claim 1, characterized in that] according to claim 1, wherein said ECL label is a ruthenium complex or an osmium complex.

3. (Amended) A polynucleotide assay apparatus[, as stated in Claim 1, characterized in that] according to claim 1, wherein said optical detector is a pickup device [(43, 266)] for detecting said ECL from a plurality of said luminous areas as a 2D image.

4. (Amended) A polynucleotide assay apparatus[, as stated in Claim 1, characterized in that] according to claim 1, wherein said second electrode is configured of a plurality of electrodes, said apparatus [being provided with] further comprises electrode selectors [(62-1S through 62-3S, 91-1 through 91-4)] for selecting a prescribed electrode out of said plurality of electrodes, [and]

wherein said voltage is applied between said electrode selected by said electrode selector and said first electrode to detect ECL from a prescribed luminous area selected out of said plurality of luminous areas.

5. (Amended) A polynucleotide assay apparatus[, as stated in Claim 4, characterized in that] according to claim 4, wherein said electrode selector is provided with TFT gate lines [(91-1 through 91-4)] each connected to [one or another] each of said plurality of electrodes.

6. (Amended) A polynucleotide assay apparatus[, as stated in Claim 1, characterized in that] according to claim 1, wherein said first electrodes and said second electrodes are arranged on the same plane in alternate repetition in parallel in one direction, said apparatus further comprises [having] a device [(45)] for controlling the duration of the application of said voltage on the basis of the velocity of the expansion of the region in which said ECL occurs and the distance between the center line of said first electrodes arranged in alternate

repetition in said one direction and the center line of said second electrode in said one direction.

7. (Amended) A polynucleotide assay apparatus[, as stated in Claim 6, characterized in that] according to claim 6, wherein said voltage is repeatedly applied.

8. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111, 52, 60)] to which different DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(3, 4, 5, 6, 61-1 through 61-6, 82-1 through 82-4)] differing with [the] a type of DNA probe and a second electrode(s) [(113-1, 113-2, 53, 62-1 through 62-3, 83-1 through 83-4)] opposite to said first electrode;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said second electrode; and

an optical detector [(33, 34, 35, 36, 43, 72-1, 72-2, 246)] for [trapping said] detecting target polynucleotides which are trapped by [through] hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides [(21)] to which is coupled an oligonucleotide [(28)] labeled with an electrochemiluminescence (ECL) label.

9. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111, 52, 60)] to which different DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(3, 4, 5, 6, 61-1 through

61-6, 82-1 through 82-4)] differing with [the] a type of DNA probe and a second electrode (s) [(113-1, 113-2, 53, 62-1 through 62-3, 83-1 through 83-4)] opposite to said first electrode;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said second electrode; and

an optical detector [(33, 34, 35, 36, 43, 72-1, 72-2, 246)] for [trapping said] detecting target polynucleotides which are trapped by [through] hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides [(21) and] labeled with an electrochemiluminescence (ECL) label, by detecting ECL resulting from the application of said voltage.

10. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111, 52, 60)] to which different DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(3, 4, 5, 6, 61-1 through 61-6, 82-1 through 82-4)] differing with [the] a type of DNA probe and a plurality of second electrodes [(113-1, 113-2, 53, 62-1 through 62-3, 83-1 through 83-4)] opposite to said first electrode;

electrode selectors [(62-1S through 62-3S, 91-1 through 91-4)] for selecting an electrode out of said plurality of second electrodes; and

a voltage applying unit [(44)] for applying a voltage between said first electrode and said selected electrode, wherein [said] target polynucleotides which are labeled with an electrochemiluminescence (ECL) label and trapped [through] by hybridization between said target polynucleotides [qualified with an ECL label] and said DNA probes are detected for

each luminous area selected out of said plurality of luminous areas, by generating ECL from said ECL label by the application of said voltage.

11. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111, 52, 60)] to which different DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(3, 4, 5, 6, 61-1 through 61-6, 82-1 through 82-4)] differing with [the] a type of DNA probe and a plurality of second electrodes [(83-1 through 83-4)] arranged on the same plane as said first electrode, wherein each of said plurality of second electrodes is separated from said first electrode and [each] arranged in the central part of [one or another] each of said luminous areas;

electrode selectors [(91-1 through 91-4)] for selecting an electrode out of said plurality of second electrodes;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said selected electrode; [and]

an optical detector [(33, 34, 35, 36, 43, 72-1, 72-2, 246)] for detecting an electrochemiluminescence (ECL) generated from [the] ECL labels which label target polynucleotides, by the application of said voltage[, further having]; and

a device [(45)] for controlling the duration of the application of said voltage on the basis of the distance between the central part of said selected second electrode and the boundary of said luminous area adjoining said luminous area in which said selected second electrode is arranged and the velocity of the expansion of the region in which said ECL occurs[;],

wherein said target polynucleotides trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas [is] are detected.

12. (Amended) A polynucleotide assay apparatus[, as stated in Claim 11, characterized in that] according to claim 11, wherein said plurality of second electrodes are arranged at equal intervals in two directions.

13. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111, 52, 60)] to which different DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(3, 4, 5, 6, 61-1 through 61-6, 82-1 through 82-4)] differing with [the] a type of DNA probe and a plurality of second electrodes [(53, 62-1 through 62-3, 83-1 through 83-4)] arranged on the same plane as said first electrode;

electrode selectors [(62-1S through 62-3S, 91-1 through 91-4)] for selecting an electrode out of said plurality of second electrodes;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said selected electrode;

an optical detector [(33, 34, 35, 36, 43, 72-1, 72-2, 246)] for detecting an electrochemiluminescence (ECL) generated from [the] ECL labels which label target polynucleotides, by the application of said voltage; and

a device [(45)] for controlling the duration of the application of said voltage on the basis of the velocity of the expansion of the region in which said ECL occurs[;], wherein

said target polynucleotides trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas [is] are detected.

14. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111, 52, 60)] to which different DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(3, 4, 5, 6, 61-1 through 61-6, 82-1 through 82-4)] differing with [the] a type of DNA probe and a plurality of second electrodes [(113-1, 113-2, 53, 62-1 through 62-3, 83-1 through 83-4)] opposite to said first electrode;

electrode selectors [(62-1S through 62-3S, 91-1 through 91-4)] for selecting an electrode out of said plurality of second electrodes; and

a voltage applying unit [(44)] for applying a voltage between said first electrode and said selected electrode,

wherein [said] target polynucleotides which are labeled with an electrochemiluminescence (ECL) label and trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas [is] are detected by detecting for each luminous area selected out of said plurality of luminous areas, by generating ECL from said ECL labels by the application of said voltage.

20. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first plate [(11)] whereon a first electrode [(111)] to which different DNA probes [(13, 14, 15, 16)] are fixed in a plurality of

luminous areas [(3, 4, 5, 6)] differing with [the] a type of DNA probe is formed and a second substrate which is arranged opposite to said first electrode and whereon a plurality of second electrodes [(113-1, 113-2)] are formed opposite to said plurality of luminous areas:

a voltage applying unit [(44)] for applying a voltage between said first electrode and said second electrode; and

an optical detector [(33, 34, 35, 36, 43)] for [trapping said] detecting target polynucleotides which are trapped by [through] hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides [(21)],

wherein [carrying out] an extending reaction using a base [(24)] labeled with an electrochemiluminescence (ECL) label to extend said hybridized DNA probes is performed, [and thereby detecting] ECL resulting from the application of said voltage is detected.[;] and the presence or absence of any extended chain [(26)] generated by said extending reaction is detected.

21. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first plate [(11)] whereon a first electrode [(111)] to which different DNA probes [(13, 14, 15, 16)] are fixed in a plurality of luminous areas [(3, 4, 5, 6)] differing with [the] a type of DNA probe is formed and a second substrate which is arranged opposite to said first electrode and whereon a plurality of second electrodes [(113-1, 113-2)] are formed opposite to said plurality of luminous areas;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said second electrode; and

an optical detector [(33, 34, 35, 36, 43)] for [trapping said] detecting target polynucleotides which are trapped by [through] hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides [(21)] to which is coupled an oligonucleotide [(28)] labeled with an electrochemiluminescence (ECL) label [and], by detecting ECL resulting from the application of said voltage.

22. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first plate [(11)] whereon a first electrode [(111)] to which different DNA probes [(13, 14, 15, 16)] are fixed in a plurality of luminous areas [(3, 4, 5, 6)] differing with [the] a type of DNA probe is formed and a second substrate which is arranged opposite to said first electrode and whereon a plurality of second electrodes [(113-1, 113-2)] are formed opposite to said plurality of luminous areas;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said second electrode; and

an optical detector [(33, 34, 35, 36, 43)] for [trapping said] detecting target polynucleotides which are trapped by [through] hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides [(21)] labeled with an electrochemiluminescence (ECL) label [and], by detecting ECL resulting from the application of said voltage.

23. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111)] to which DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(82-1 through 82-4)] differing with [the] a type of DNA probe and a plurality of second electrodes [(83-1 through 83-4)] arranged on the same plane as said first electrode, wherein each of said plurality of second electrodes is separated from said first electrode, and [each] arranged in the central part of [one or another] each of said luminous areas, and arranged at equal intervals in two directions;

electrode selectors [(91-1 through 91-4)] for selecting an electrode out of said plurality of second electrodes;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said selected electrode; [and]

an optical detector [(43, 246)] for detecting an electrochemiluminescence (ECL) generated from [the] ECL labels which label target polynucleotides, by the application of said voltage[, further having]; and

a device [(45)] for controlling the duration of the application of said voltage on the basis of the distance between the central part of said selected second electrode and the boundary of said luminous area adjoining said luminous area in which said selected second electrode is arranged and the velocity of the expansion of the region in which said ECL occurs[;],

wherein said target polynucleotides trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas [is] are detected.

24. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first electrode [(111, 52, 60)] to which DNA probes [(13, 14, 15, 16)] are fixed in luminous areas [(3, 4, 5, 6, 61-1 through 61-6)] differing with [the] a type of DNA probe and a plurality of second electrodes [(62-1 through 62-3)] arranged on the same plane as said first electrode, wherein each of said plurality of second electrodes is separated from said first electrode, and arranged in one direction in parallel with part of said first electrode;

electrode selectors [(62-1S through 62-3S)] for selecting an electrode out of said plurality of second electrodes;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said selected electrode; [and]

an optical detector [(72-1, 72-2)] for detecting an electrochemiluminescence (ECL) generated from [the] ECL labels which label target polynucleotides, by the application of said voltage; and

a device [(45)] for controlling the duration of the application of said voltage on the basis of the velocity of the expansion of the region in which said ECL occurs[;],

wherein said target polynucleotides trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas [is] are detected.

25. (Amended) A polynucleotide assay apparatus [characterized in that it has] comprising:

a polynucleotide detecting cell provided with a first plate [(11)] whereon a first electrode [(111)] to which different DNA probes [(13, 14, 15, 16)] each having a phosphorothioate bond are fixed in a plurality of luminous areas [(3, 4, 5, 6)] differing with

[the] a type of DNA probe is formed and a second substrate which is arranged opposite to said first electrode and whereon a plurality of second electrodes [(113-1, 113-2)] are formed opposite to said plurality of luminous areas;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said second electrode; and

an optical detector [(33, 34, 35, 36, 43)] for [trapping said] detecting target polynucleotides which are trapped by [through] hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides [(21)],

wherein [carrying out] an extending reaction using a base [(24)] labeled with an electrochemiluminescence (ECL) label to extend said hybridized DNA probes is performed, [and thereby detecting] ECL resulting from the application of said voltage is detected,[;] and the presence or absence of any extended chain [(26)] generated by said extending reaction is detected.